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**PHILOSOPHICAL  
TRANSACTIONS**

**OF THE**

**ROYAL SOCIETY**

**OF**

**LONDON.**

**FOR THE YEAR MDCCCLIV.**

**VOL. 144.**

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**LONDON:**

**PRINTED BY RICHARD TAYLOR AND WILLIAM FRANCIS, RED LION COURT, FLEET STREET.**

**MDCCCLIV.**

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**FOR THE YEAR MDCCCLIV.**

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**MDCCCLIV.**

## A D V E R T I S E M E N T.

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THE Committee appointed by the *Royal Society* to direct the publication of the *Philosophical Transactions*, take this opportunity to acquaint the Public, that it fully appears, as well from the Council-books and Journals of the Society, as from repeated declarations which have been made in several former *Transactions*, that the printing of them was always, from time to time, the single act of the respective Secretaries till the Forty-seventh Volume; the Society, as a Body, never interesting themselves any further in their publication, than by occasionally recommending the revival of them to some of their Secretaries, when, from the particular circumstances of their affairs, the *Transactions* had happened for any length of time to be intermitted. And this seems principally to have been done with a view to satisfy the Public, that their usual meetings were then continued, for the improvement of knowledge, and benefit of mankind, the great ends of their first institution by the Royal Charters, and which they have ever since steadily pursued.

But the Society being of late years greatly enlarged, and their communications more numerous, it was thought advisable that a Committee of their members should be appointed, to reconsider the papers read before them, and select out of them such as they should judge most proper for publication in the future *Transactions*; which was accordingly done upon the 26th of March 1752. And the grounds of their choice are, and will continue to be, the importance and singularity of the subjects, or the advantageous manner of treating them; without pretending to answer for the certainty of the facts, or propriety of the reasonings, contained in the several papers so published, which must still rest on the credit or judgement of their respective authors.

It is likewise necessary on this occasion to remark, that it is an established rule of the Society, to which they will always adhere, never to give their opinion, as a Body,

upon any subject, either of Nature or Art, that comes before them. And therefore the thanks, which are frequently proposed from the Chair, to be given to the authors of such papers as are read at their accustomed meetings, or to the persons through whose hands they received them, are to be considered in no other light than as a matter of civility, in return for the respect shown to the Society by those communications. The like also is to be said with regard to the several projects, inventions, and curiosities of various kinds, which are often exhibited to the Society; the authors whereof, or those who exhibit them, frequently take the liberty to report and even to certify in the public newspapers, that they have met with the highest applause and approbation. And therefore it is hoped that no regard will hereafter be paid to such reports and public notices; which in some instances have been too lightly credited, to the dishonour of the Society.

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The Meteorological Journal hitherto kept by the Assistant Secretary at the Apartments of the Royal Society, by order of the President and Council, and published in the Philosophical Transactions, has been discontinued. The Government, on the recommendation of the President and Council, has established at the Royal Observatory at Greenwich, under the superintendence of the Astronomer Royal, a Magnetical and Meteorological Observatory, where observations are made on an extended scale, which are regularly published. These, which correspond with the grand scheme of observations now carrying out in different parts of the globe, supersede the necessity of a continuance of the observations made at the Apartments of the Royal Society, which could not be rendered so perfect as was desirable, on account of the imperfections of the locality and the multiplied duties of the observer.

A List of Public Institutions and Individuals, entitled to receive a copy of the Philosophical Transactions of each year, on making application for the same directly or through their respective agents, within five years of the date of publication.

*Observatories.*

Armagh.  
Cape of Good Hope.  
Dublin.  
Edinburgh.  
Greenwich.  
Madras.

*Institutions.*

Barbadoes ..... Library and Museum.  
Calcutta ..... Asiatic Society.  
Cambridge ..... Philosophical Society.  
Dublin ..... Royal Dublin Society.  
..... Royal Irish Academy.  
Edinburgh ..... Royal Society.  
London ..... Admiralty Library.  
..... Chemical Society.  
..... Entomological Society.  
..... Geological Society.  
..... Geological Survey of Great Britain.  
..... Horticultural Society.  
..... Institute of British Architects.  
..... Institution of Civil Engineers.  
..... Linnean Society.  
..... London Institution.  
..... Medical and Chirurgical Society.  
..... Queen's Library.  
..... Royal Asiatic Society.  
..... Royal Astronomical Society.  
..... Royal College of Physicians.  
..... Royal Geographical Society.  
..... Royal Institution of Great Britain.  
..... Royal Society of Literature.  
..... Society of Antiquaries.  
..... Society for the Encouragement of Arts.  
..... The Treasury Library.  
..... United Service Museum.  
..... Zoological Society.  
Malta ..... Public Library.  
Manchester ..... Literary and Philosophical Society.  
Oxford ..... Ashmolean Society.  
..... Radcliffe Library.  
Swansea ..... Royal Institution.  
Woolwich ..... Royal Artillery Library.

*Belgium.*

Brussels ..... Royal Academy of Sciences.

*Denmark.*

Altona ..... Royal Observatory.  
Copenhagen ..... Royal Society of Sciences.

*France.*

Paris ..... Academy of Sciences.  
..... Dépôt de la Marine.  
..... Ecole des Mines.

Paris ..... Entomological Society.  
..... Geographical Society.  
..... Geological Society.  
..... Jardin des Plantes.  
Toulouse ..... Academy of Sciences.

*Germany.*

Bonn ..... Cæsarean Acad. of Naturalists.  
Frankfort ..... Natural History Society.  
Giessen ..... University.  
Göttingen ..... University.  
Mannheim ..... Observatory.  
Munich ..... Royal Academy of Sciences.

*Italy.*

Naples ..... Institute of Sciences.  
Milan ..... Institute of Sciences, Letters and Arts.  
Modena ..... Italian Society of Sciences.  
Turin ..... Royal Academy of Sciences.

*Netherlands.*

Amsterdam ..... Royal Institute.  
Haarlem ..... Dutch Society of Sciences.  
Rotterdam ..... Batavian Society of Experimental Philosophy.

*Prussia.*

Berlin ..... Royal Academy of Sciences.  
..... Society of Experimental Philosophy.

*Portugal.*

Lisbon ..... Royal Academy of Sciences.

*Russia.*

Moscow ..... Imperial Society of Naturalists.  
Pulkowa ..... Observatory.  
St. Petersburg ..... Imperial Academy of Sciences.

*Spain.*

Cadiz ..... Observatory.

*Sweden and Norway.*

Drontheim ..... Royal Society of Sciences.  
Stockholm ..... Royal Academy of Sciences.

*Switzerland.*

Geneva ..... Société de Phys. et d'Hist. Naturelle.

*United States.*

Boston ..... American Academy of Sciences.  
Cambridge ..... Harvard University.  
Philadelphia ..... American Philosophical Society.  
Washington ..... Smithsonian Institution.  
..... Observatory.

The fifty Foreign Members of the Royal Society,



A List of Public Institutions and Individuals, entitled to receive a copy of the Astronomical Observations (including Magnetism and Meteorology) made at the Royal Observatory at Greenwich, on making application for the same directly or through their respective agents, within two years of the date of publication.

<i>Observatories.</i>	<i>Institutions.</i>
Altona.	Aberdeen.....University.
Armagh.	Berlin .....Academy.
Berlin.	Bologna .....Academy.
Breslau.	Boston .....American Academy of Sciences.
Brussels.	Brunswick, U.S. ...Bowdoin College.
Cadiz.	Cambridge .....Trinity College Library.
Cambridge.	Cambridge, U.S. ...Harvard University.
Cape of Good Hope.	Dublin .....University.
Coimbra.	Edinburgh .....University.
Copenhagen.	Royal Society.
Dorpat.	Glasgow .....University.
Dublin.	Göttingen .....University.
Edinburgh.	Leyden .....University.
Helsingfors.	London .....Board of Ordnance.
Königsberg.	Queen's Library.
Madras.	Royal Institution.
Mannheim.	Royal Society.
Marseilles.	Oxford.....Savilian Library.
Milan.	Paris .....Academy of Sciences.
Munich.	Board of Longitude.
Oxford.	Dépôt de la Marine.
Palermo.	Philadelphia .....American Philosophical Society.
Paris.	St. Andrews .....University.
Seeberg.	St. Petersburg ...Imperial Academy.
Trevandrum.	Stockholm .....Royal Academy of Sciences.
Tübingen.	Upsal .....Royal Society.
Turin.	Waterville (U.S.)...College.
Vienna.	
Wilna.	
	<i>Individuals.</i>
	Christie, S. H., Esq. .... Woolwich.
	Lubbock, Sir John William, Bart. ... London.
	Lowndes Professor of Astronomy ... Cambridge.
	Plumian Professor of Astronomy .....
	President of the Royal Society..... London.
	Smyth, Rear-Admiral W. H. .... Aylesbury.
	South, Sir James ..... Kensington.

List of Observatories, Institutions and Individuals, entitled to receive a Copy of the  
Magnetical and Meteorological Observations made at the Royal Observatory, Green-  
wich.

*Observatories.*

Bombay . . . . .	
Barnaoul . . . . .	M. Prang, 1st.
Cairo . . . . .	M. Lambert.
Cambridge, United States . . . . .	Prof. J. Lovering.
Catherineburgh . . . . .	M. Rochkoff.
Christiania . . . . .	C. Hansteen.
Cincinnati . . . . .	Dr. Locke.
Gotha . . . . .	
Hammerfest . . . . .	
Heidelberg . . . . .	M. Tiedemann.
Kasan . . . . .	M. Simonoff.
Kew . . . . .	J. Welsh.
Kremsmünster . . . . .	P. A. Reslhuber.
Leipsic . . . . .	Professor Mobius.
Marburg . . . . .	Professor Gerling.
Nertchinsk . . . . .	M. Prang, 2nd.
Nikolaieff . . . . .	Dr. Knorre.
Pekin . . . . .	M. Gachkévitch.
Prague . . . . .	K. Jelinek.
Pulkowa . . . . .	F. G. W. Struve.
St. Petersburg . . . . .	A. T. Kupffer.
Sitka . . . . .	Messrs. Homann and Ivanoff.
Stockholm . . . . .	Professor H. Selander.
Tiflis . . . . .	M. Philadelphine.
Toronto . . . . .	Professor Cherriman.
Upsal . . . . .	Professor Svanberg.
Warsaw . . . . .	Col. G. Du Plat (British Consul General).
Washington . . . . .	Lt. Maury, U.S. Navy.

*Institutions.*

Bombay . . . . .	Geographical Society.
Bonn . . . . .	University.
Bowditch Library . . . . .	United States.
Cambridge . . . . .	Philosophical Society.
Cherkow . . . . .	University.
Falmouth . . . . .	Royal Cornwall Poly- technic Society.
Kiew . . . . .	University.
London . . . . .	House of Lords, Library.

London . . . . .	House of Commons, Li- brary.
	King's College.
	Royal Society.
	University.
Moscow . . . . .	University.
St. Bernard . . . . .	Convent.
St. Petersburg . . . . .	Geographical Society.
Washington . . . . .	Smithsonian Institution.
Woolwich . . . . .	Office of Mag. and Met. Publication.

*Individuals.*

Bache, Dr. A. D. . . . .	Washington.
Barlow, P. W., Esq. . . . .	Woolwich.
Demidoff, Prince Anatole de . . . . .	Florence.
Dovè, Prof. H. W. . . . .	Berlin.
Erman, Dr. Adolph . . . . .	Berlin.
Fox, R. W., Esq. . . . .	Falmouth.
Gauss, Prof. K. F. . . . .	Göttingen.
Gilliss, Lt. J. M., U.S. Navy . . . . .	Washington.
Harris, Sir W. Snow . . . . .	Plymouth.
Howard, Luke, Esq. . . . .	Tottenham.
Humboldt, Baron von . . . . .	Berlin.
Kaemtzt, Prof. L. F. . . . .	Dorpat.
Kreil, Prof. K. . . . .	Vienna.
Kupffer, A. T. . . . .	St. Petersburg.
Lawson, Henry G., Esq. . . . .	Bath.
Lloyd, Rev. Dr. . . . .	Dublin.
Loomis, Professor . . . . .	New York University.
Melvill, Sir J. C. . . . .	East India House.
Phillips, John, Esq. . . . .	York.
Quetelet, A. . . . .	Brussels.
Redfield, W. C., Esq. . . . .	New York.
Reid, Col. Sir W., R.E. . . . .	Malta.
Riddell, Capt., R.A. . . . .	Woolwich.
Sabine, Colonel, R.A. . . . .	Woolwich.
Senftenberg, Baron von . . . . .	Prague.
Wartmann, Professor Elie . . . . .	Geneva.
Younghusband, Capt., R.A. . . . .	

ADJUDICATION of the MEDALS of the ROYAL SOCIETY for the year 1853 by  
the PRESIDENT and COUNCIL.

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The COPLEY MEDAL to HEINRICH WILHELM DOVÈ, for his work "On the Distribution of Heat over the Surface of the Earth."

The ROYAL MEDAL to CHARLES DARWIN, Esq., for his works entitled "Geological Observations on Coral Reefs," "Volcanic Islands," and on "South America;" and his work, "Fossil Cirrhipeda of Great Britain, Section Lepadidæ, Monograph of the Cirrhipeda."

*(The second ROYAL MEDAL was not awarded.)*

The BAKERIAN LECTURE for 1853 was delivered by Colonel SABINE, V.P.R.S., and entitled "On the Influence of the Moon on the Magnetic Declination at Toronto, St. Helena, and Hobarton."

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The COPLEY MEDAL to Professor JOHANNES MÜLLER, for his important contributions to different branches of Physiology and Comparative Anatomy, and particularly for his researches on the Embryology and Structure of the Echinodermata, contained in a series of memoirs published in the Transactions of the Royal Academy of Sciences of Berlin.

A ROYAL MEDAL to Dr. HOFMANN, F.R.S., for his researches in Organic Chemistry.

A ROYAL MEDAL to Dr. HOOKER, F.R.S., for his researches in various branches of science, especially in Botany, as Naturalist of the Antarctic Expedition of Sir JAMES ROSS, and in an Expedition to the eastern part of the Himalaya Range, of which researches part has been published in works entitled, "The Antarctic Flora" and "The Flora of New Zealand," and in various other communications, and part is now in course of publication.

The RUMFORD MEDAL to Dr. NEIL ARNOTT, F.R.S., author of various contributions to the elucidation of the principles and improvement of the practice of heating and ventilation, for the successful construction of a new smoke-consuming and fuel-saving fire-grate, described in the Journal of the Society of Arts of May 12, 1854.

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The BAKERIAN LECTURE for 1854 was delivered by THOMAS GRAHAM, Esq., F.R.S., and entitled, "On Osmotic Force."

# C O N T E N T S.

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ERRATUM.—PART I. 1854.

Page 14, line 20, *for* NAUMANN *read* NEUMANN.